PROGRESS REPORT

PM&E ANALYSIS

SP-G2

PROGRESS REPORT

- PM&E EWG-18 =90 AND EWG-93
- FLUVIAL 12
- INDICATORS OF HYDRAULIC ALTERATION ANALYSIS
- RIFFLE CHARACTERISTICS, VELOCITIES, AND PERMEABILITIES
- MEANDER BELT INVESTIGATION

PM&E's

- RICHARD HARRIS REPORTED LAST MEETING
- EWG-18 AND -93 READY TO BE DISCUSSED

EWG-18

RIPPING AND/OR RAKING OF SELECTED SECTIONS IN THE LOW FLOW CHANNEL OF THE FEATHER RIVER FOR ENHANCEMENT OF SALMON AND STEELHEAD SPAWNING HABITAT

RELATED PM&Es

- EWG-90 SIMILAR
- EWG-91 AND -92 SUPPLEMENT GRAVEL


ARMORING


MAJOR STORM EVENTS

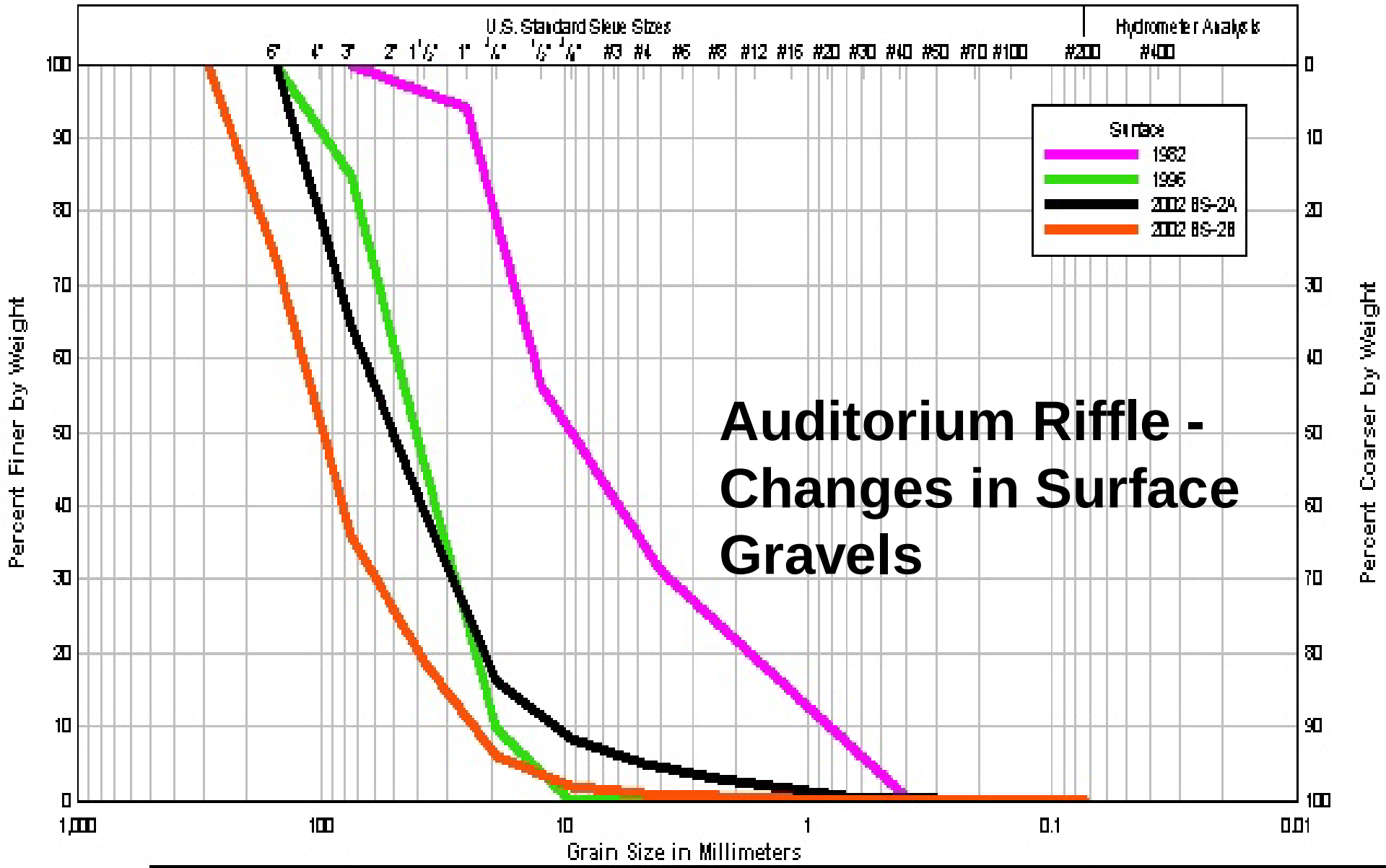
RIVER ARMORING

- MOST OF THE LOW FLOW REACH IS ARMORED
- GRAVEL BED SAMPLING IN 1980, 1994, AND 2003 SHOWS THAT ARMORING IS BECOMING MORE SEVERE WITH TIME
- BED ARMORING EXTENDS DOWNSTREAM TO GRIDLEY
- PARTS OF THE LOW FLOW REACH ARMORED WITH COBBLES AND BOULDERS TOO COARSE FOR SALMON TO MOVE
- SALMON FORCED TO SPAWN IN LESS THAN IDEAL AREAS

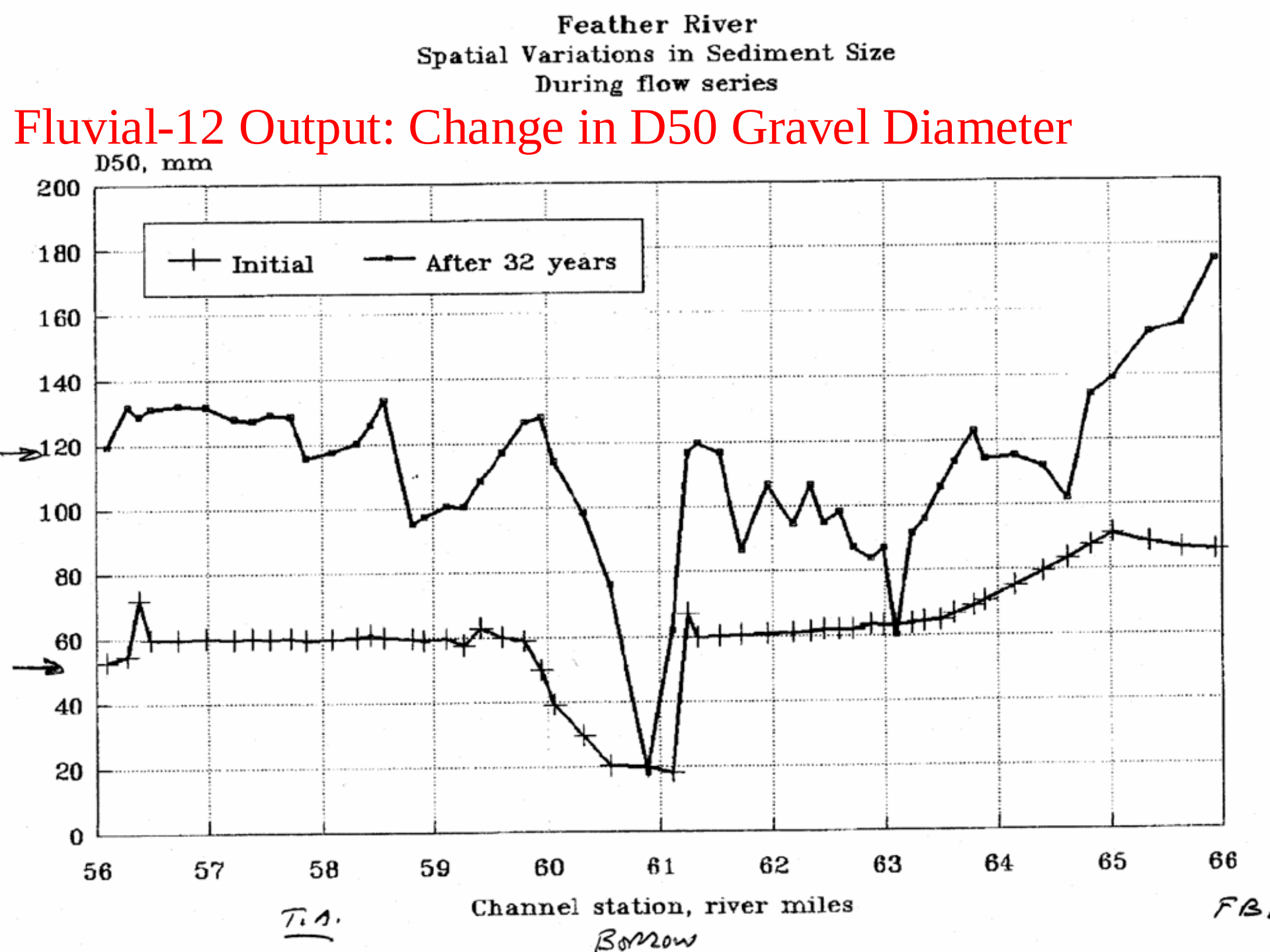
Auditorium Riffle -
Bulk Gravel Sampling and Sieving

Grain Size Distribution Curve

Bottom Of Moe's Ditch/Top of Auditorium
BS-2 (Surface) 1982; 1996; 2002



Fluvial-12 Output: Change in D50 Gravel Diameter



EWG-18 ENVIRONMENTAL BENEFITS

- INCREASE THE AREA OF SUITABLE SPAWNING HABITAT
- REDUCE SUPERPOSITION OF REDDS
- INCREASE EGG SURVIVAL

IMPLEMENTATION AREA

- LOW FLOW REACH PRIMARILY
- LIMITED AREAS OF HIGH FLOW REACH, BUT HIGHER TEMPERATURES. LESS SPAWNING ACTIVITY, AND LESS ARMORING MAKES THIS AREA LESS SUITABLE FOR REHAB ACTIVITY

LOW FLOW REACH

- ESTABLISHED RIFFLE AREAS
- MOSTLY STABLE IN TODAY'S HYDRAULIC REGIME
- UPPER THIRD OF RIFFLES GENERALLY PREFERRED FOR SPAWNING
- STEELHEAD PREFER SIDECHANNELS?

RIPPING

- RIPPERS ON BULLDOZER BREAKS UP ARMORED LAYER, INCREASES INTRA-GRAVEL PERMEABILITY, AND ALLOWS FOR THE WASHING AWAY OF FINER SEDIMENT
- COARSE ARMOR MATERIAL MIXED WITH UNDERLYING GRAVEL

RAKING

- REMOVAL OF COARSE UPPER LAYER TO EXPOSE FINER GRAVEL LAYER BELOW
- COARSER MATERIAL IS WINDROWED OR REMOVED FROM RIFFLE AREA

RIPPING AND RAKING

- USED SUCCESSFULLY IN MANY PLACES
- BEST IF COMBINED WITH GRAVEL AUGMENTATION
- USE GRAVEL RETENTION STRUCTURES SUCH AS BOULDER AND COBBLE WEIRS
- NOT A ONE-TIME MEASURE
- USED ON THE LOW FLOW REACH IN THE PAST
- POTENTIAL WATER QUALITY CONCERNS

EWG-93A

IMPROVE SPAWNING HABITAT FOR FISH IN THE LOW FLOW REACH THROUGH MECHANICAL AND HYDRAULIC CHANGES

RELATED PM&E

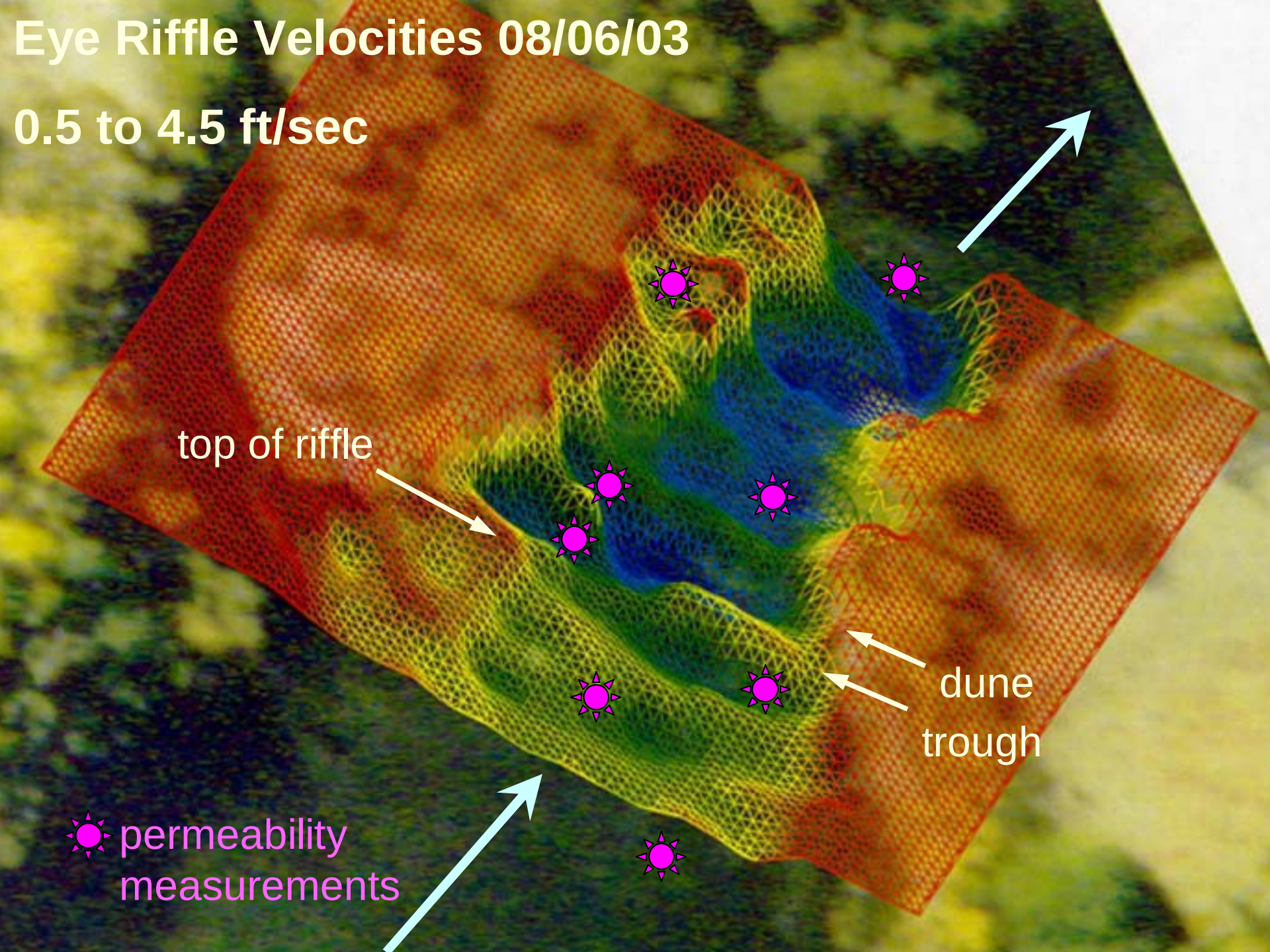
- EWG-18 –90,-91,-92 THAT PROPOSE RIPPING AND RAKING, AND HABITAT IMPROVEMENTS
- EWG-16A AND -16B FOR CREATING SIDE CHANNEL HABITAT

ACTIONS

- EXCAVATING SIDE CHANNELS
- CREATING RIPARIAN SURFACES AT DIFFERENT ELEVATIONS ABOVE RIVER
- AUGMENTING FLOW
- PLACING BOULDERS AND ROOTWADS,

SIDE CHANNEL CONSTRUCTION KLAMATH RIVER

MOE'S DITCH
FEATHER RIVER


Eye Riffle Velocities 08/06/03
0.5 to 4.5 ft/sec
top of riffle
dune
trough
permeability
measurements

EWG-93B

IMPROVE SPAWNING HABITAT FOR SPLITTAIL IN THE LOWER FEATHER RIVER THROUGH MECHANICAL AND HYDRAULIC CHANGES

RELATED PME's

- EWG-19 AND -22 PROPOSING LEVEE SETBACKS AND FLOODPLAIN BENCHES

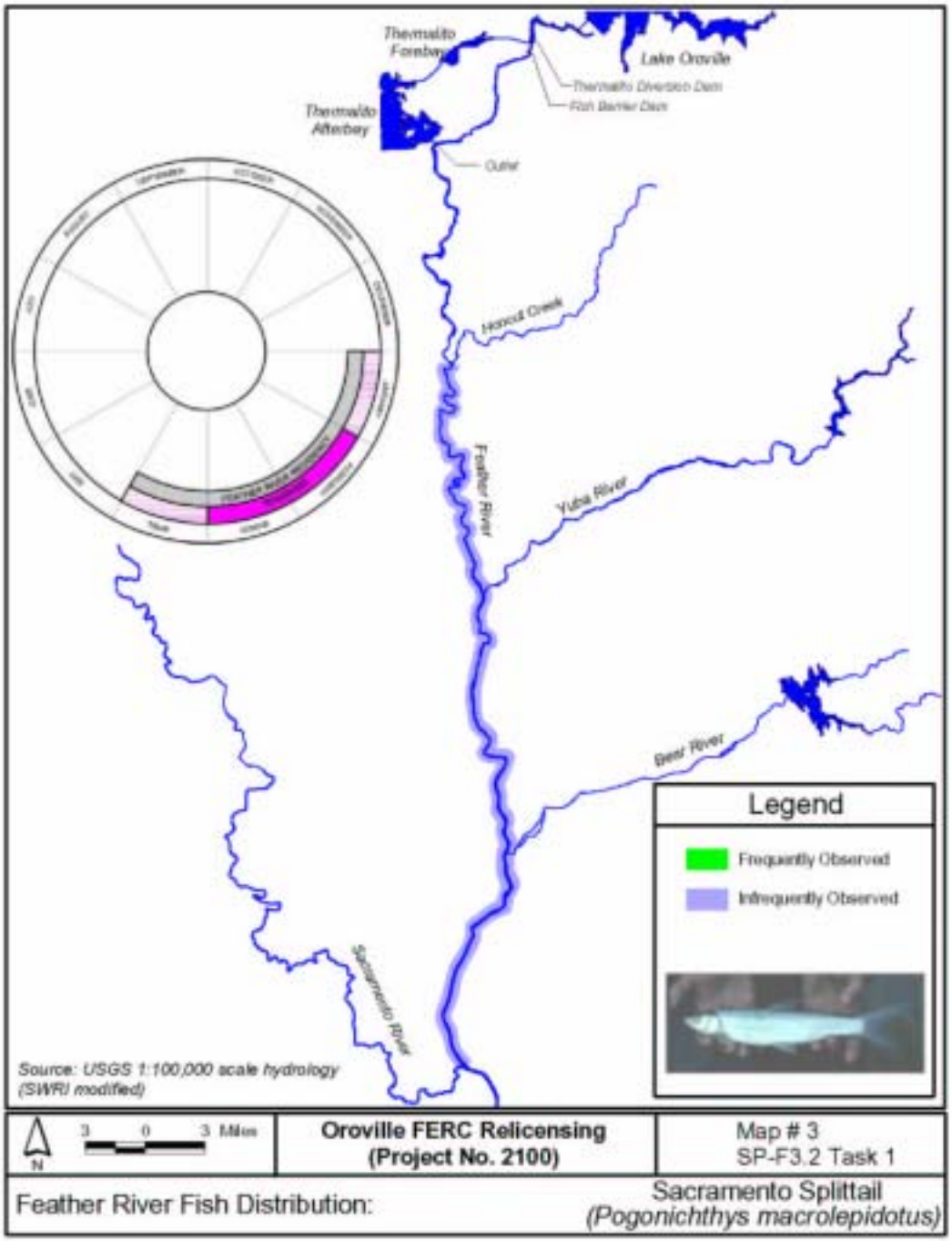
SPLITTAIL SPAWNING HABITAT

- OVERBANK AREAS
- FLOODED FOR LONG PERIODS OF TIME DURING SPRING MONTHS
- SHALLOW WATER WITH LOW OR NO VELOCITY
- GRASSY VEGETATION

ENVIRONMENTAL CONSIDERATIONS

- NATURAL RANGE OF SPLITTAIL
- FLOODPLAIN INUNDATION TIME
- FEATHER RIVER IS NOW ENTRENCHED
- CONSIDER SPLITTAIL LIFESPAN AND FLOOD RECURRENCE INTERVALS

SPLITTAIL RANGE



ACTIONS

- REMOVING RIPARIAN BERMS
- CREATING LOWER TOPOGRAPHIC SURFACES
- ARTIFICIAL FLOOD FLOWS

RIPARIAN BERMS

TOPOGRAPHIC SURFACES AFFECT INUNDATION TIME

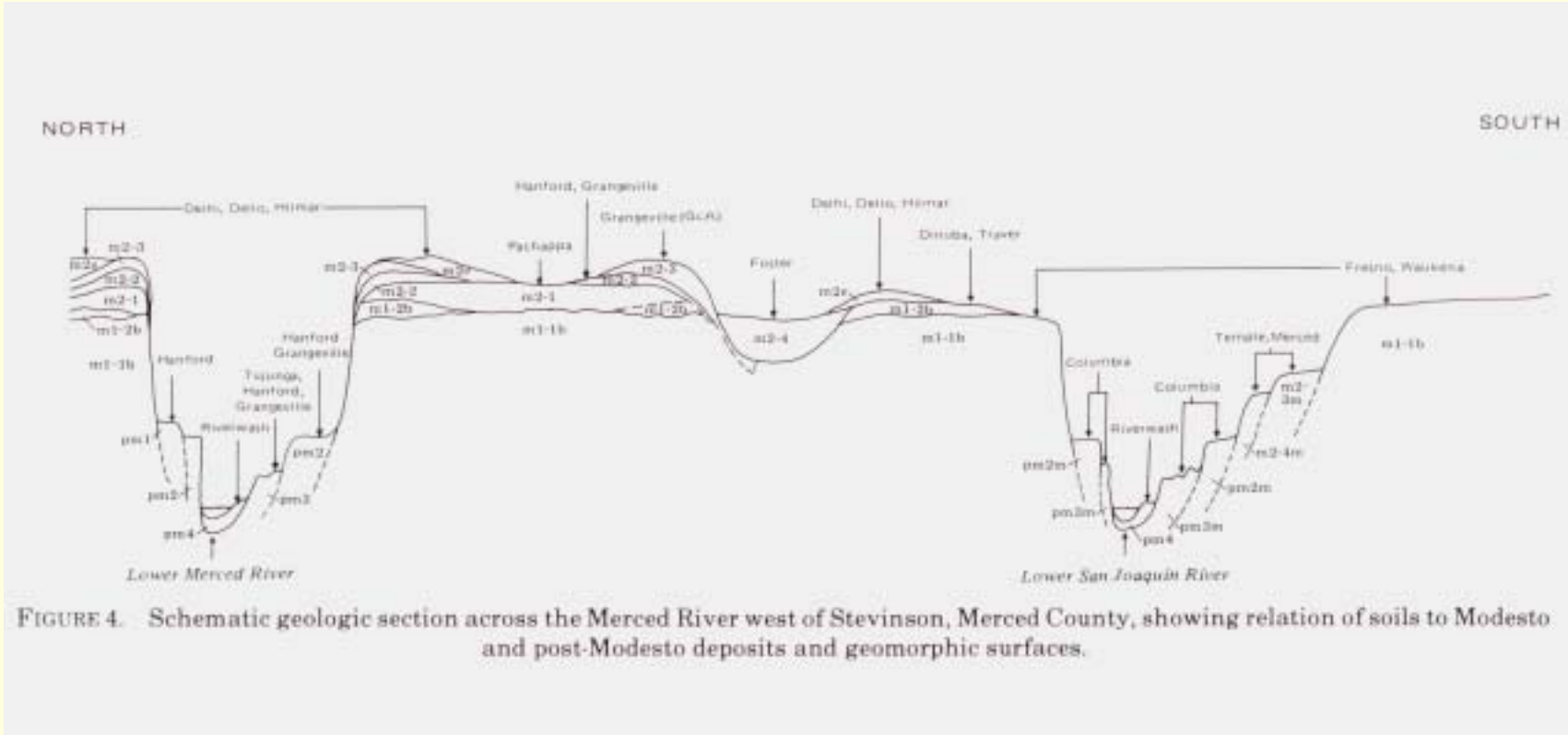
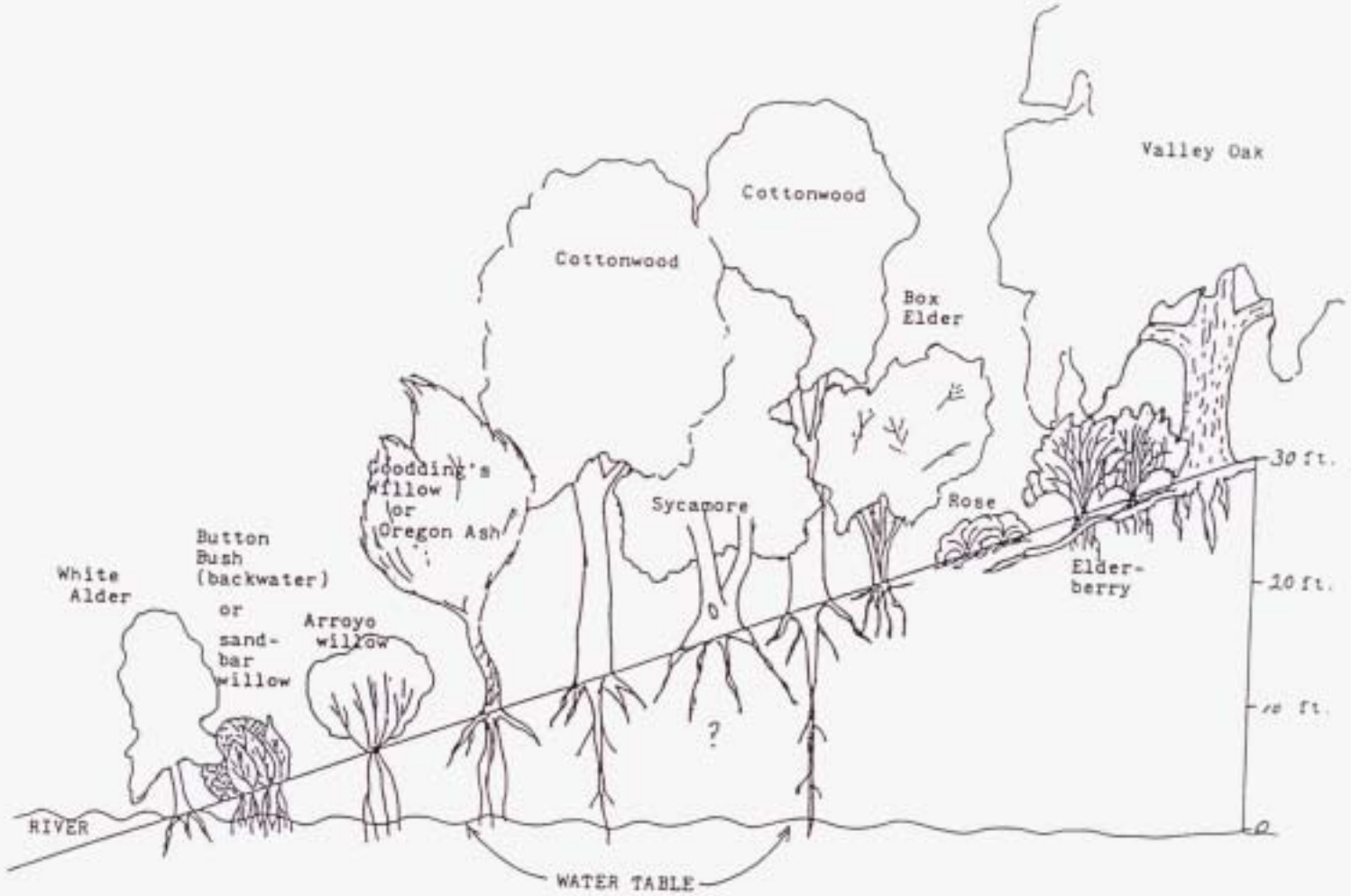


FIGURE 4. Schematic geologic section across the Merced River west of Stevinson, Merced County, showing relation of soils to Modesto and post-Modesto deposits and geomorphic surfaces.

DEPTH TO WATER AFFECTS VEGETATION



Source: Griggs, pers. comm. (1991)

ENVIRONMENTAL BENEFITS

- IMPROVE SPLITTAIL SPAWNING
- RECONNECT RIVER WITH FLOOPLAIN
- INCREASE RIPARIAN CORRIDOR COMPLEXITY
- INCREASE RIPARIAN WILLOW SCRUB FOREST

PRACTICAL CONSIDERATIONS

- EXPENSIVE TO IMPLEMENT
- RIVER IS ENTRENCHED WITH STEEP HIGH BANKS
- PRESENT FLOODPLAIN RARELY INUNDATED
- REQUIRES MOVING LOTS OF DIRT
- FLOW MODIFICATIONS DURING SPRING ALSO NECESSARY
- NEED TO MAP EXISTING FLOODPLAIN SURFACES

SP-G2 PROGRESS REPORT

GEOMORPHIC CHANGES DOWNSTREAM OF OROVILLE DAM

FLUVIAL -12

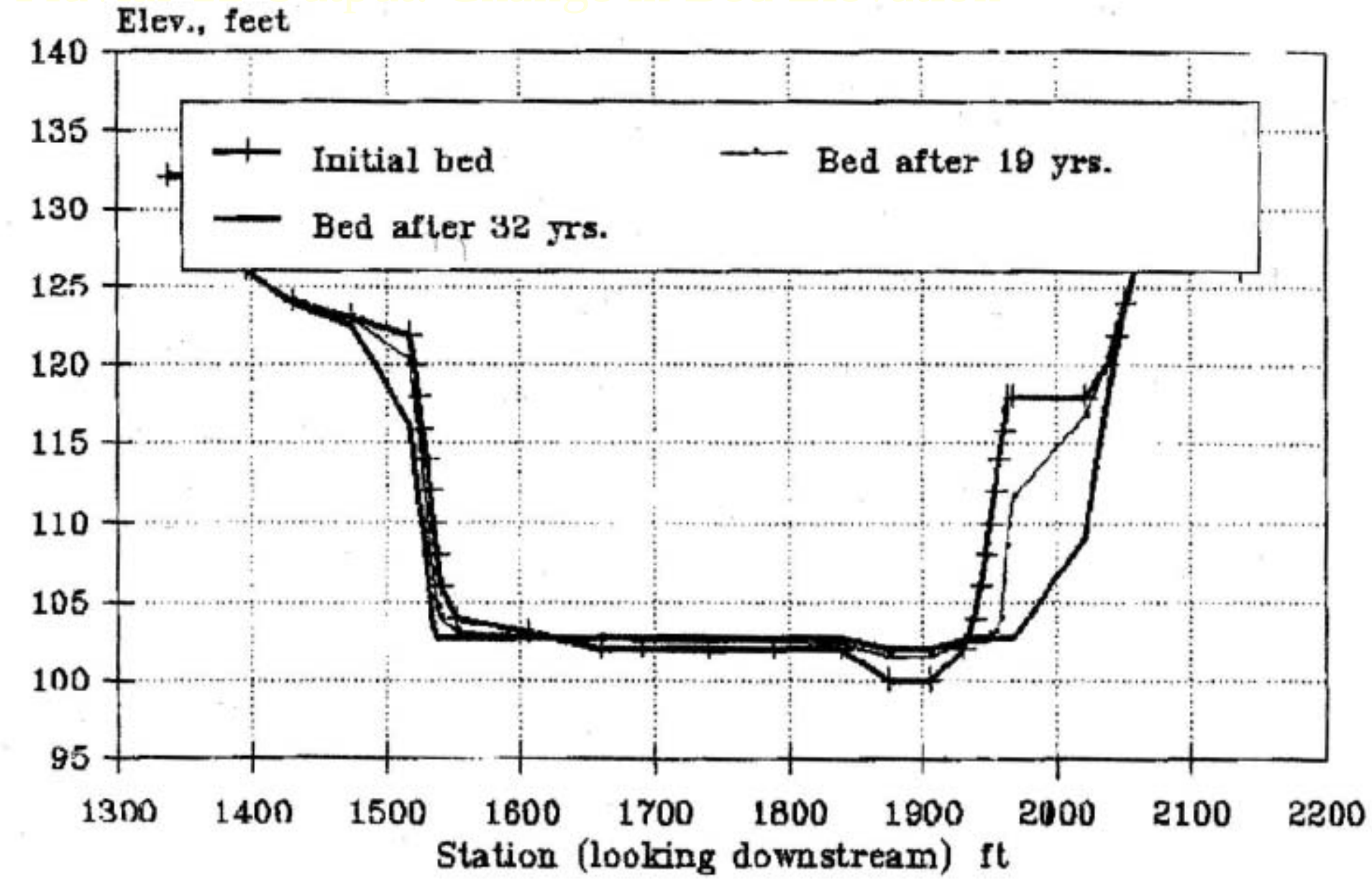
MODEL THE MOVEMENT OF SEDIMENT AND PREDICT LONG TERM GEOMORPHIC CHANGES

FLUVIAL 12

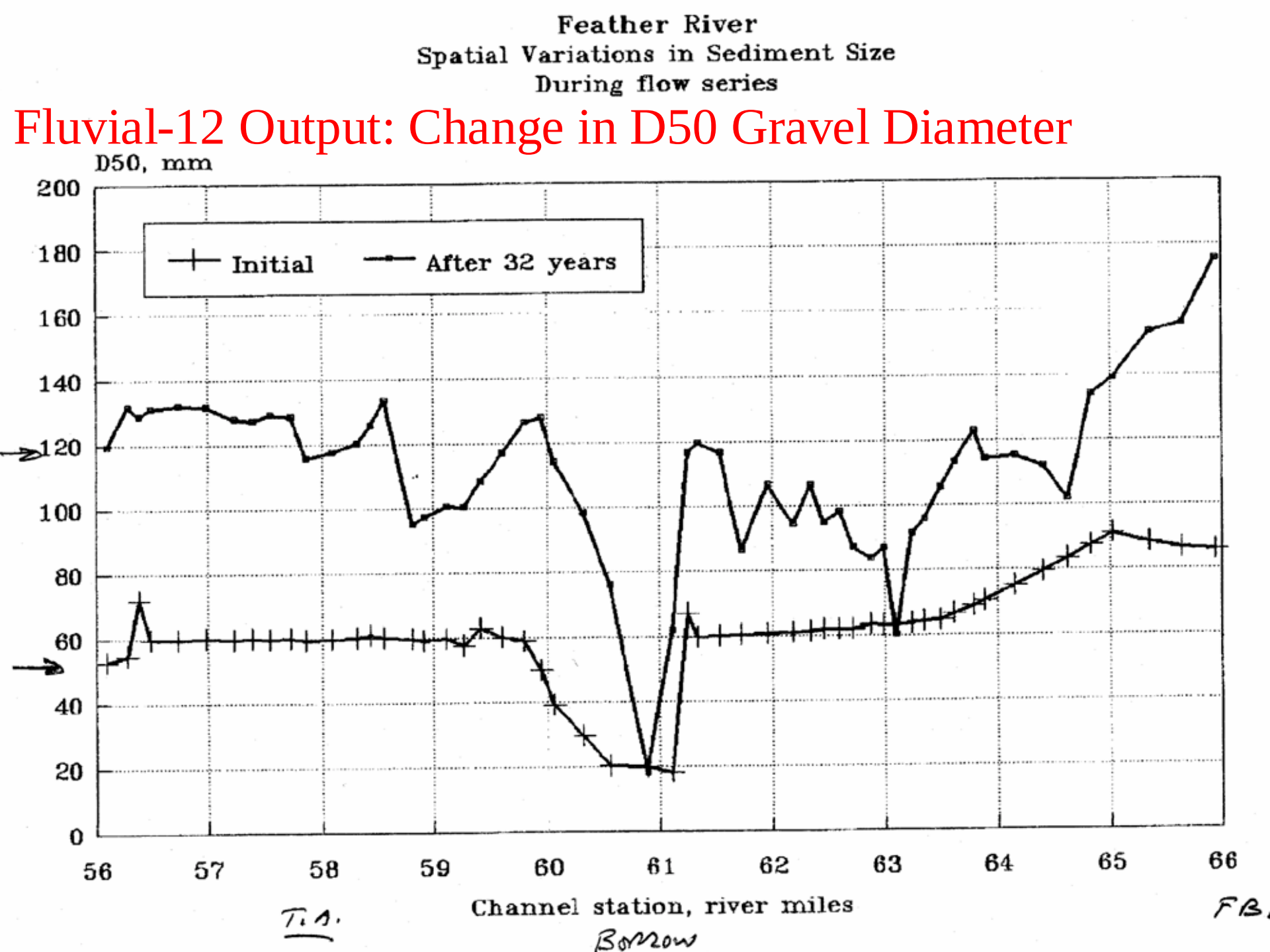
- ALL DATA HAS BEEN ENTERED INTO MODEL FOR THE CALIBRATION REACH.
- ENGELUND – HANSEN BEDLOAD FORMULA HAS BEEN SELECTED
- NUMEROUS CALIBRATION RUNS HAVE BEEN DONE
- MOST OF THE DATA ENTERED INTO MODEL FOR THE STUDY REACH
- MISSING SEDIMENT DATA FOR THE LOWER PART OF REACH
- NEED MORE CROSS-SECTIONS TO CALIBRATE

Section 59.28
Changes during flow series

Fluvial-12 Output: Change in Bed Elevation



Fluvial-12 Output: Change in D50 Gravel Diameter



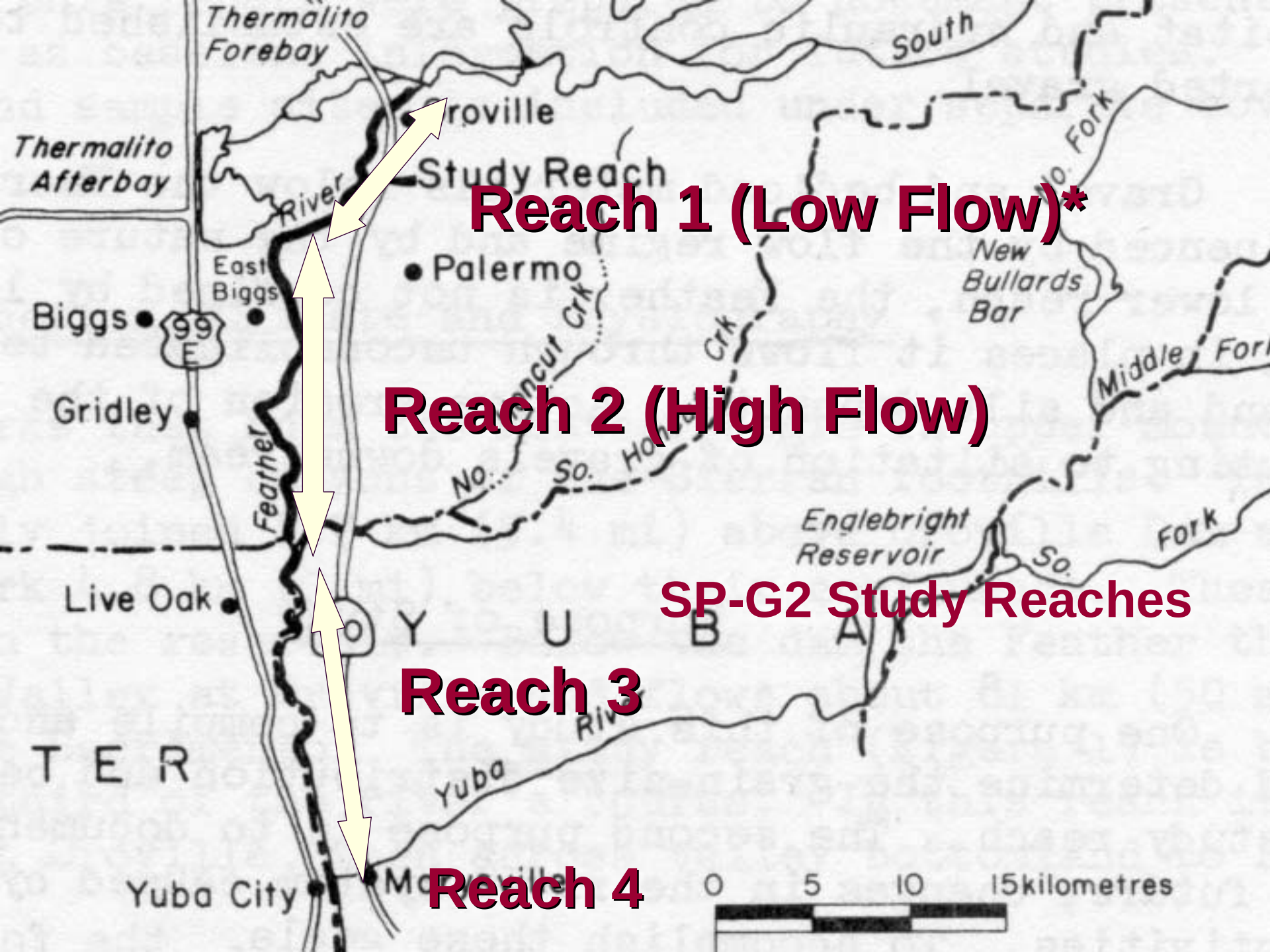
INDICATORS OF HYDRAULIC ALTERATION

PRE- AND POST OROVILLE DAM HYDROLOGIC CHANGES

WATER SUPPLY ENGINEERING SECTION

INDICATORS OF HYDRAULIC ALTERATION ANALYSIS

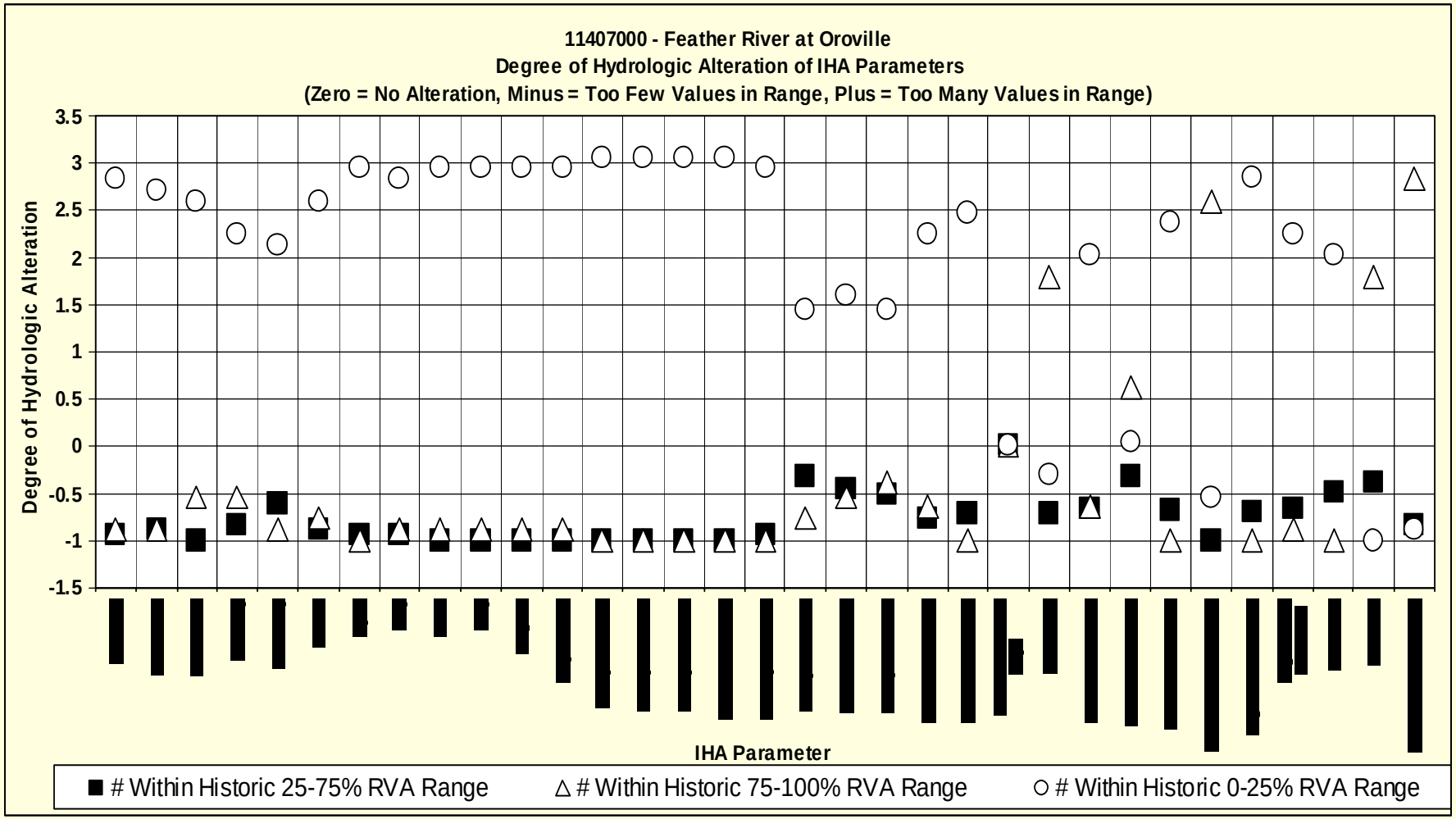
- THREE ANALYSES DONE TO REPRESENT THE LOW FLOW, HIGH FLOW, AND BELOW YUBA CITY REACHES
- DRAFT REPORT COMPLETED


Thermalito Forebay
Thermalito Afterbay
Oroville
Study Reach
River
Palermo
East Biggs
Biggs
99 E
Gridley
Feather
Live Oak
Yuba City
Reach 1 (Low Flow)*
Reach 2 (High Flow)
Reach 3
Reach 4
SP-G2 Study Reaches
South
Fork
New Bullards Bar
Middle
Englebright Reservoir
Yuba
0 5 10 15kilometres

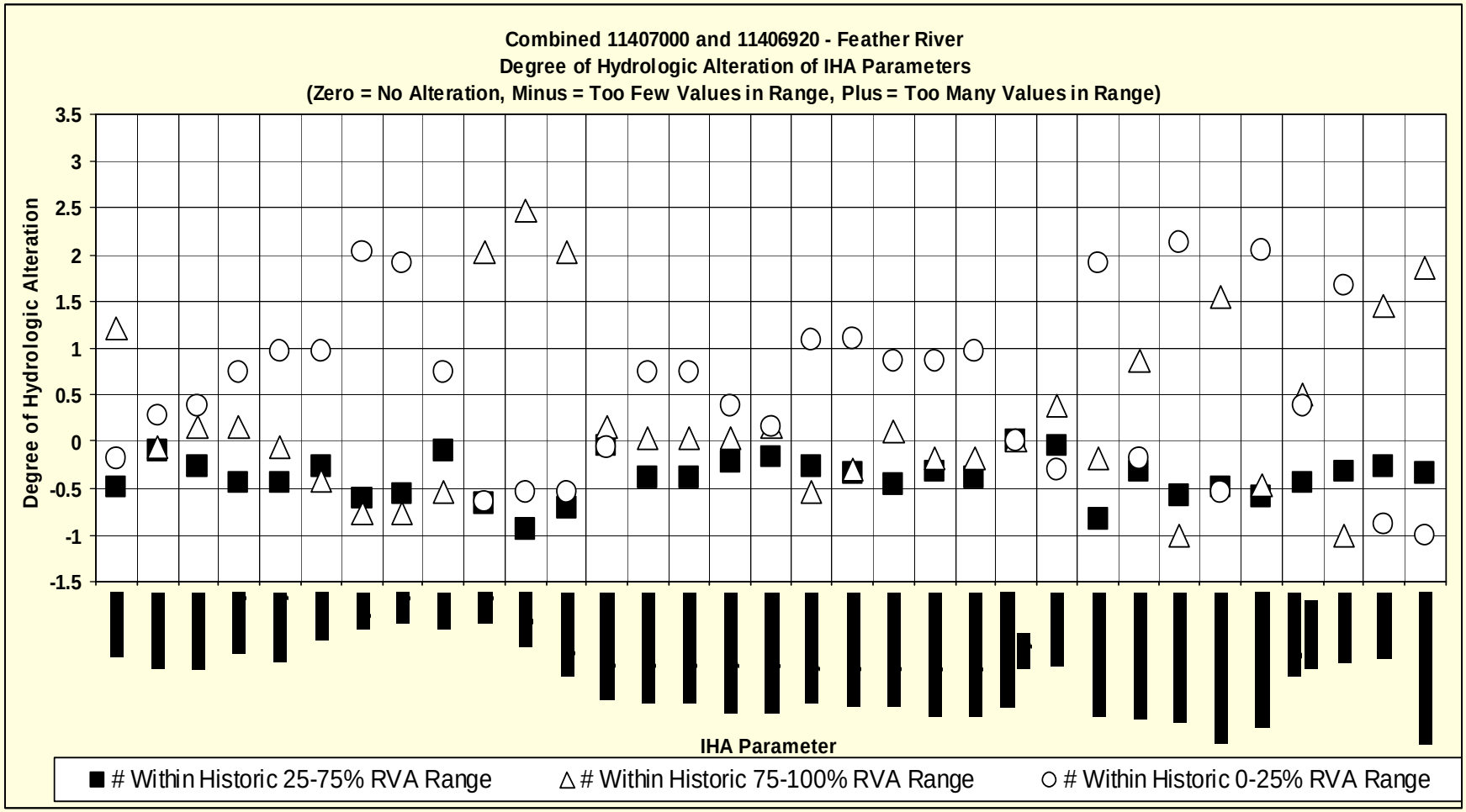
WHAT IS IHA?

- THE NATURE CONSERVANCY
- SHOWS CHANGES AND DEGREE OF CHANGE FOR 33 HYDRAULIC VARIABLES
- COMPARES PRE- AND POST OROVILLE DAM HYDROLOGIC PERIODS
- USE THE OROVILLE, OROVILLE PLUS THERMALITO, AND THE NICOLAUS GAGES

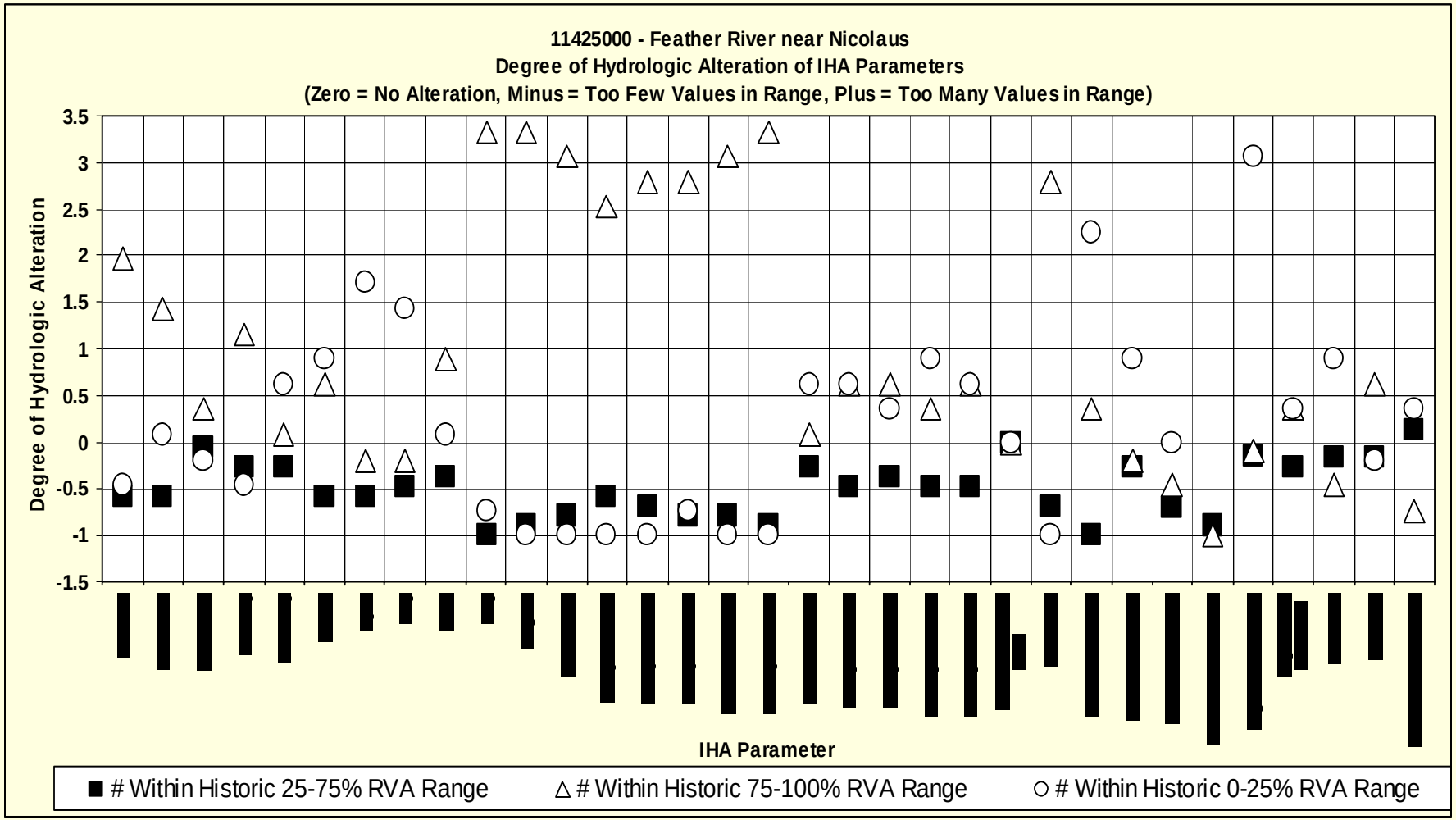
CHANGES IN HYDRAULIC VARIABLES OROVILLE



CHANGES IN HYDRAULIC VARIABLES OROVILLE PLUS THERMALITO

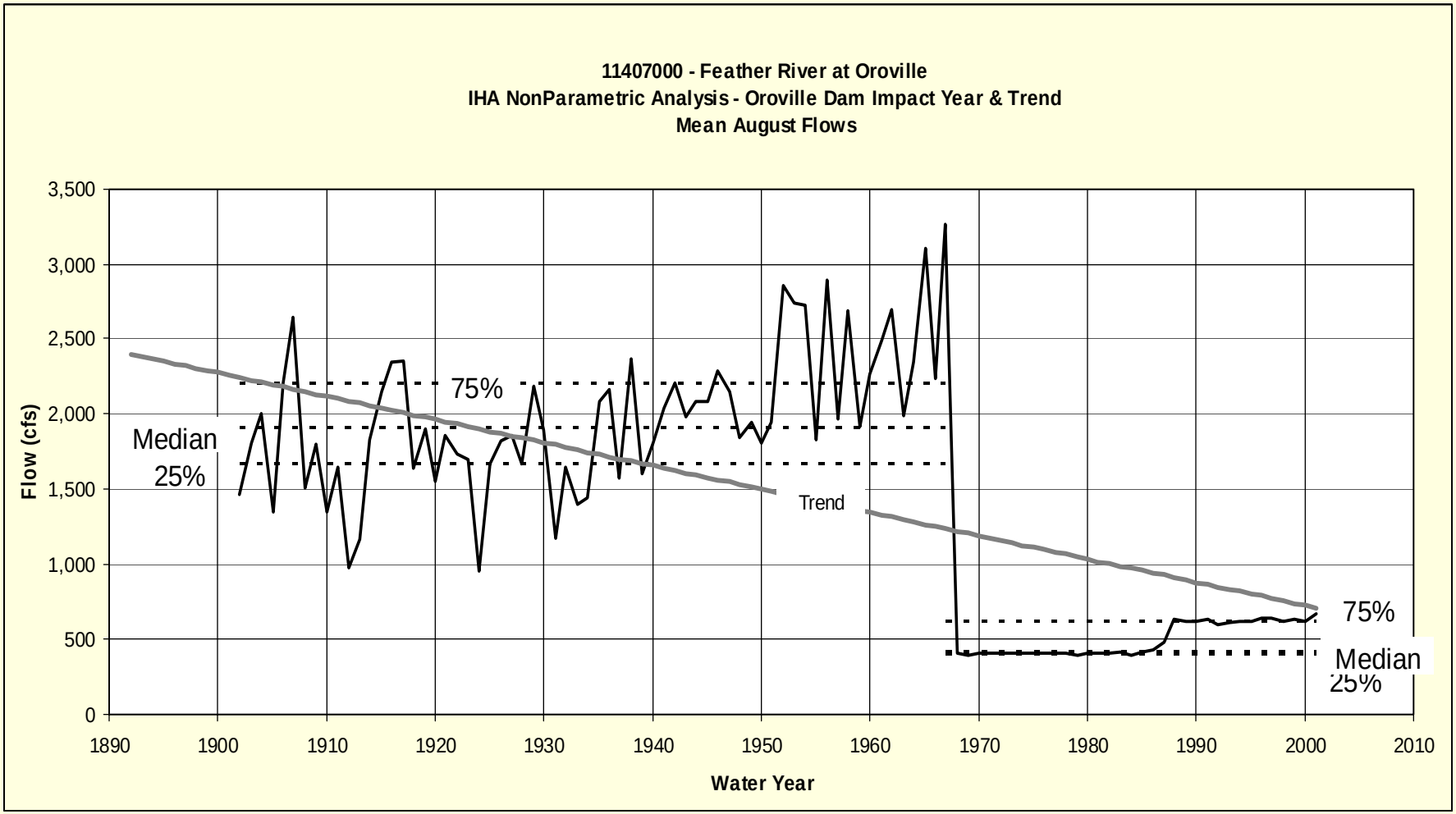


CHANGES IN HYDRAULIC VARIABLE HIGH FLOW REACH 4

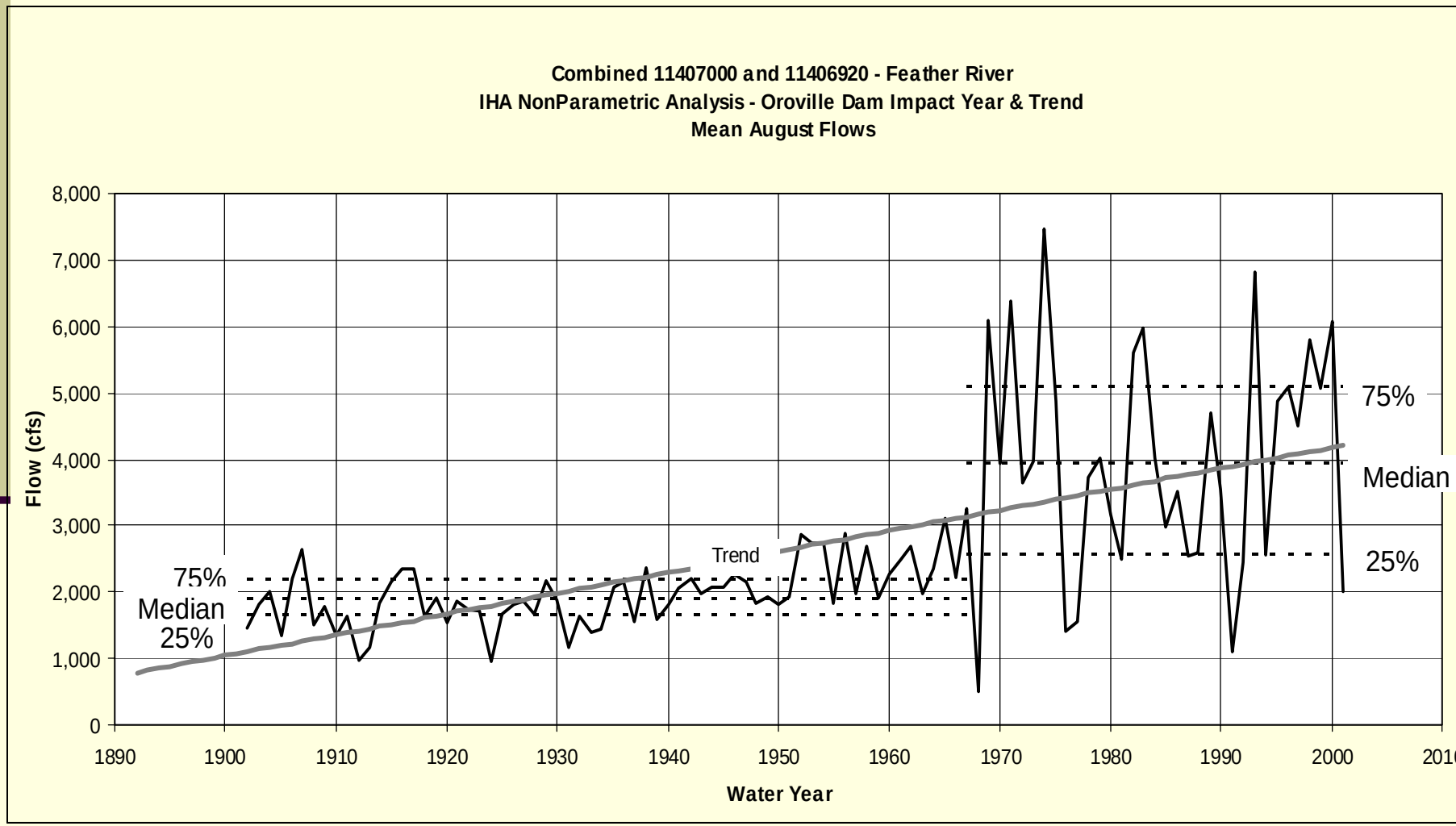


MEAN AUGUST FLOW, FEATHER RIVER IN LOW FLOW REACH

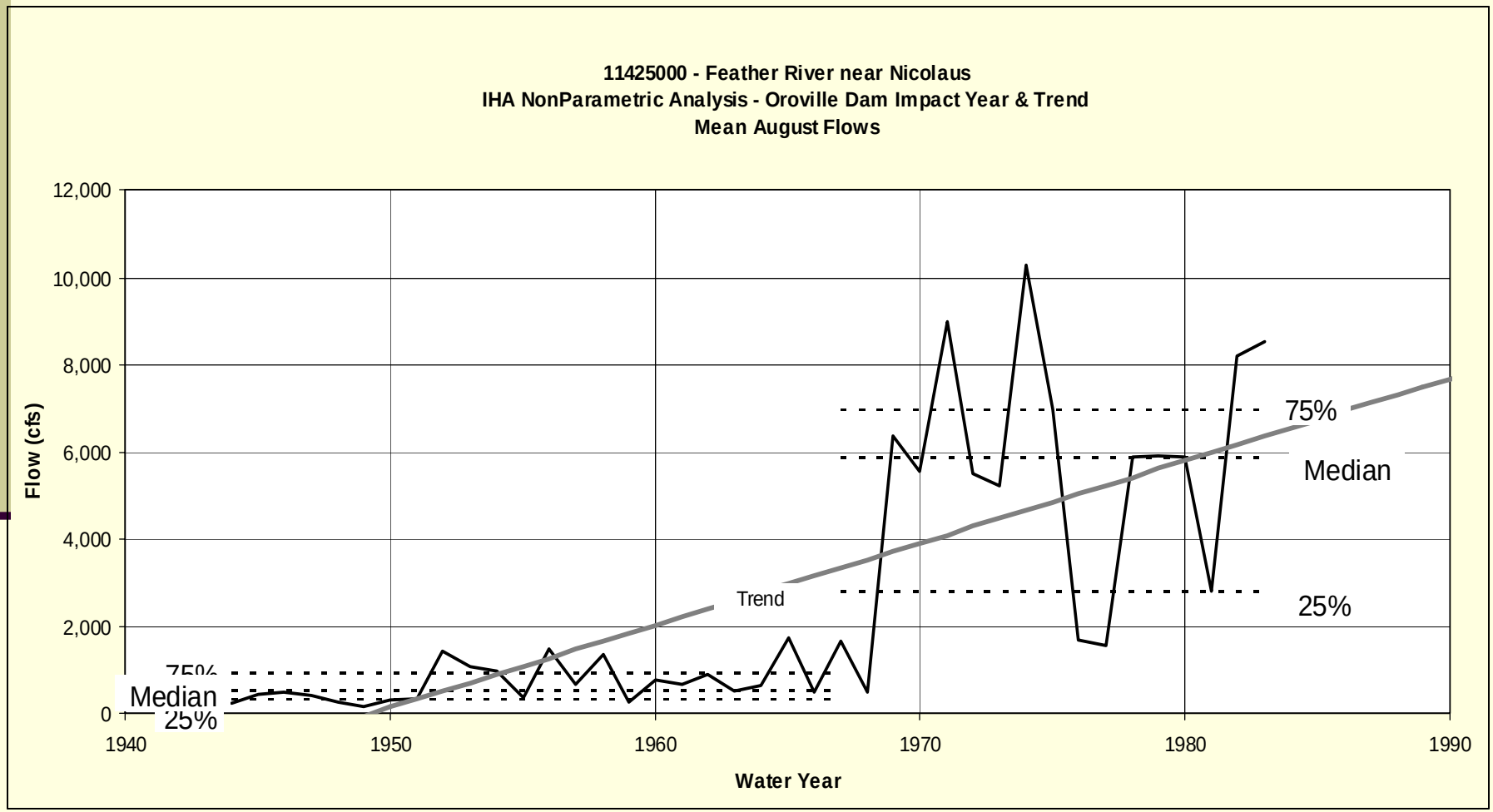
- GRAPH



MEAN AUGUST FLOW NEAR OROVILLE IN HIGH FLOW REACH

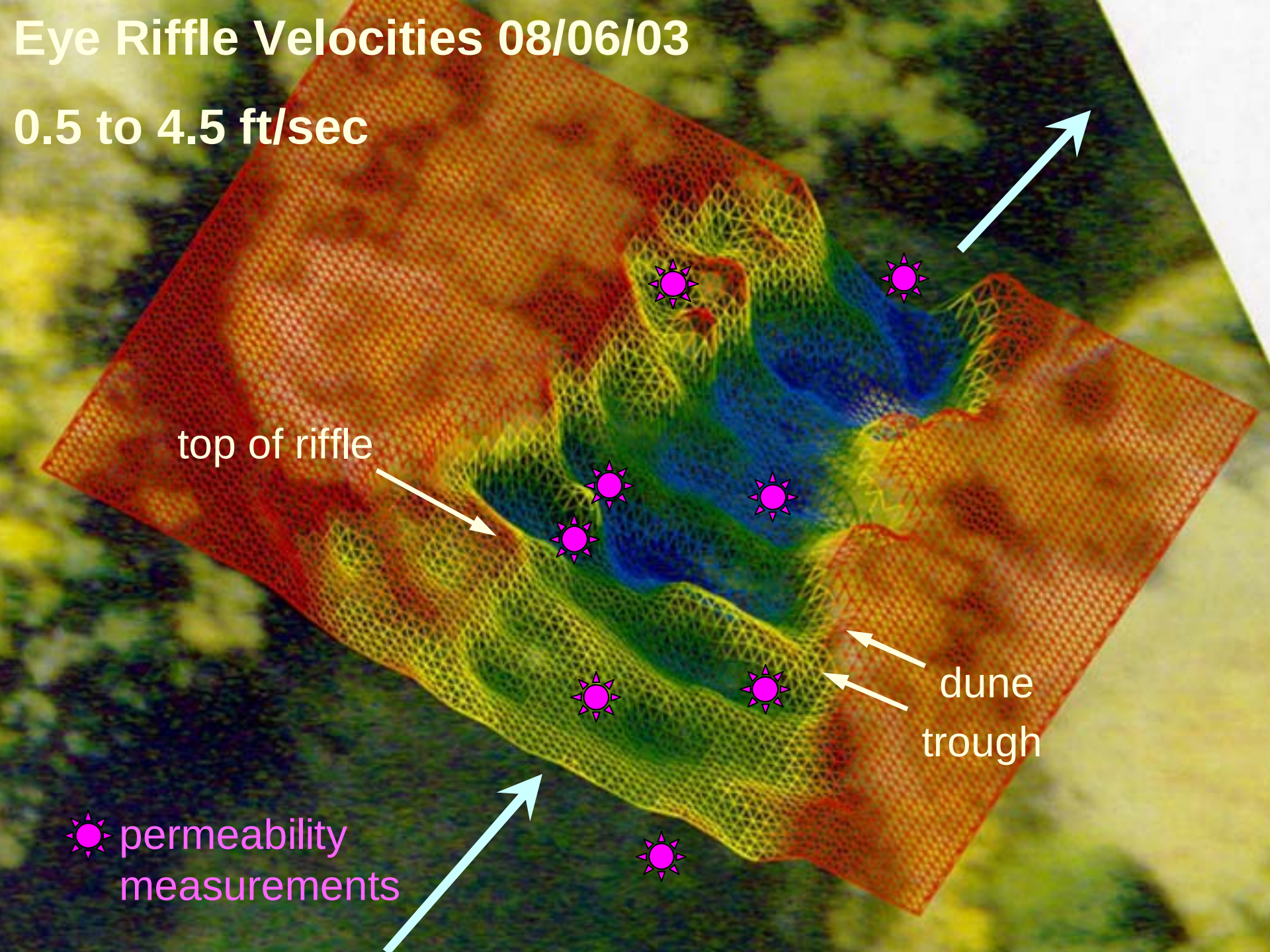


MEAN AUGUST FLOW
FEATHER RIVER NEAR NICOLAUS



RIFFLE CHARACTERISTICS

VELOCITIES, PERMEABILITIES, AND GRAVEL SIZE DISTRIBUTIONS


Eye Riffle Velocities 08/06/03
0.5 to 4.5 ft/sec
top of riffle
dune
trough
permeability
measurements

RIFFLE PERMEABILITY

- PROTOCOL DETERMINED
- EQUIPMENT PURCHASED AND BORROWED
- BEGIN MEASUREMENTS SEPTEMBER

BULK GRAVEL SAMPLING

- LOW FLOW REACH COMPLETED
- ALL BUT 5 SAMPLES IN HIGH FLOW REACH COMPLETED

MEANDER BELT MAPPING

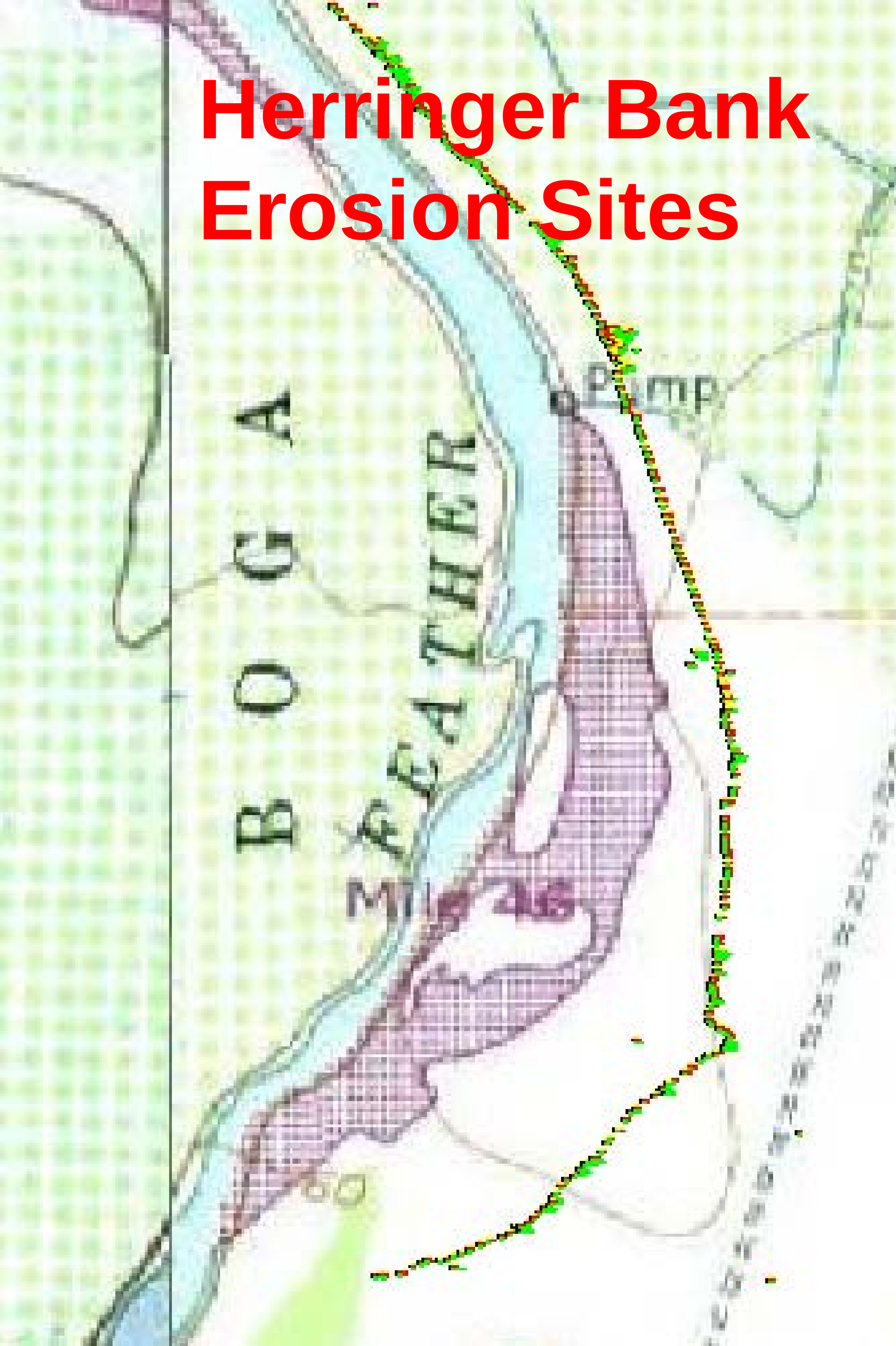
DOCUMENT RIVER MEANDERING AND BANK EROSION

MEANDER BELT MAPPING

- DWR PHOTOGRAMMETRY DOING THE ORTHO RECTIFYING OF PHOTOS
- CENTRAL DISTRICT PLOTTING THE MEANDER LINES
- FOUR SETS OF MEANDER LINES COMPLETED
- 1967 PHOTOGRAPHS AND 1907 SURVEY MAPS RECTIFIED BUT NOT PLOTTED
- EXPECTED COMPLETION OCTOBER 1

Lower Feather River Bank Erosion Sites, Thermalito Afterbay to Yuba City

Herringer Bank Erosion Sites



GEOLOGIC CONTROL AND RIPRAP DELINEATED

ERODING SANDY ALLUVIAL BANK

DREDGER TAILINGS

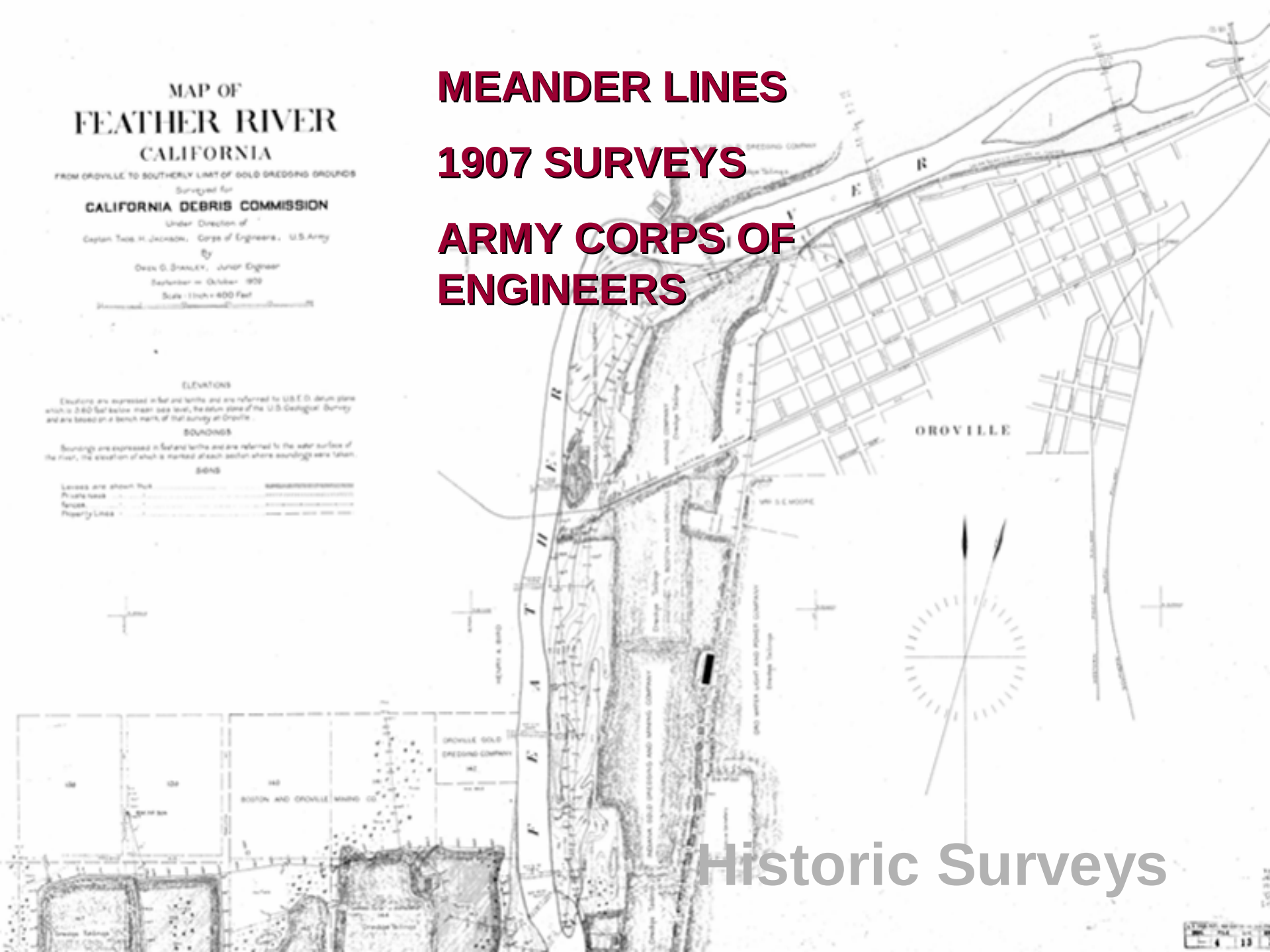
Oroville Wildlife Area Dredging Piles

Feather River- High Flow Reach - Bank Erosion Site

Active Bank Erosion – Bank Swallow Colonies

MEANDER BELT MAPPING

- DATES ARE 1907, 1947, 1967, 1986, 1998, 2003
- 1967, 1986, 1998 COMPLETED
- OCTOBER COMPLETION DATE

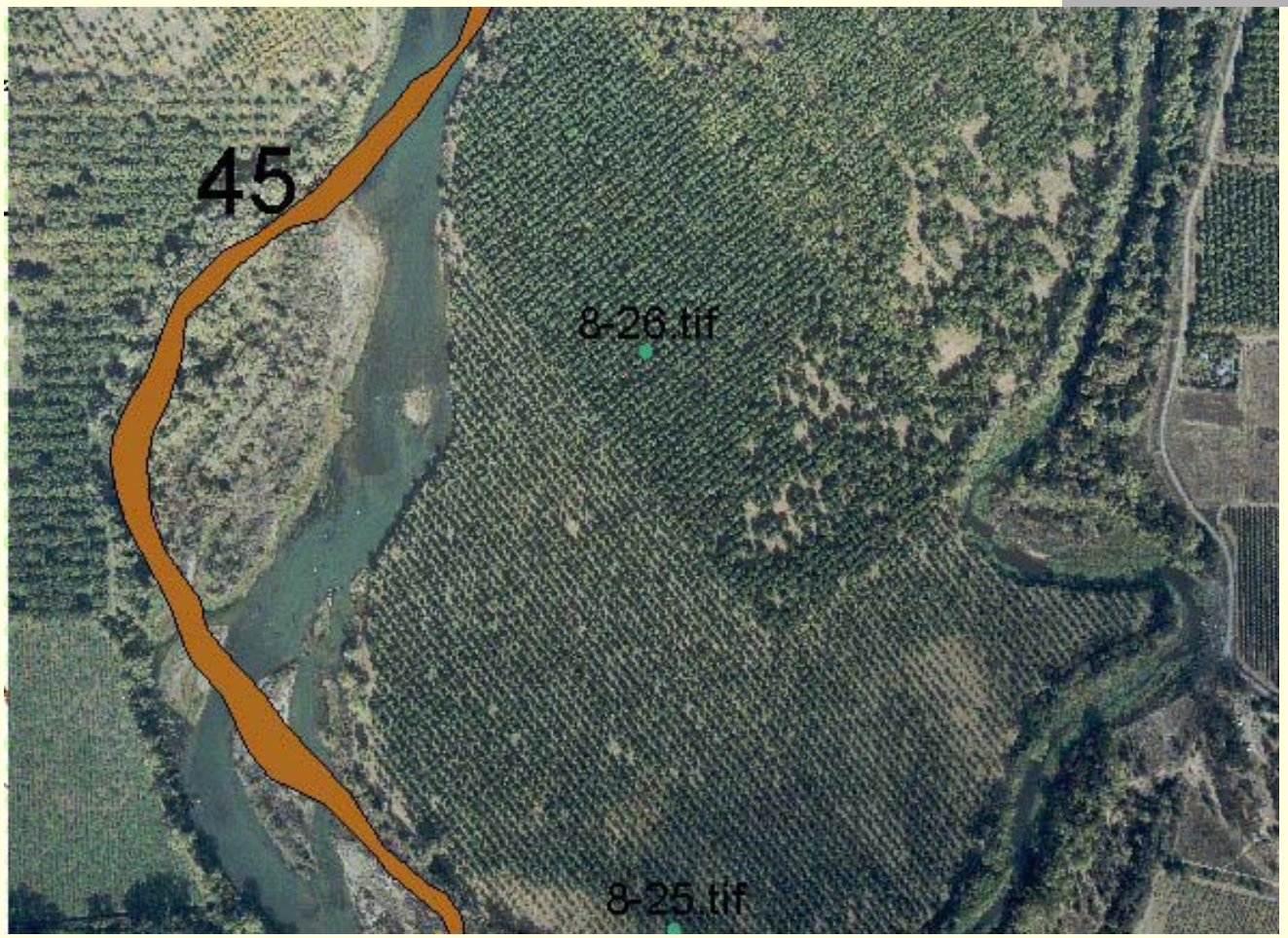


MEANDER LINES

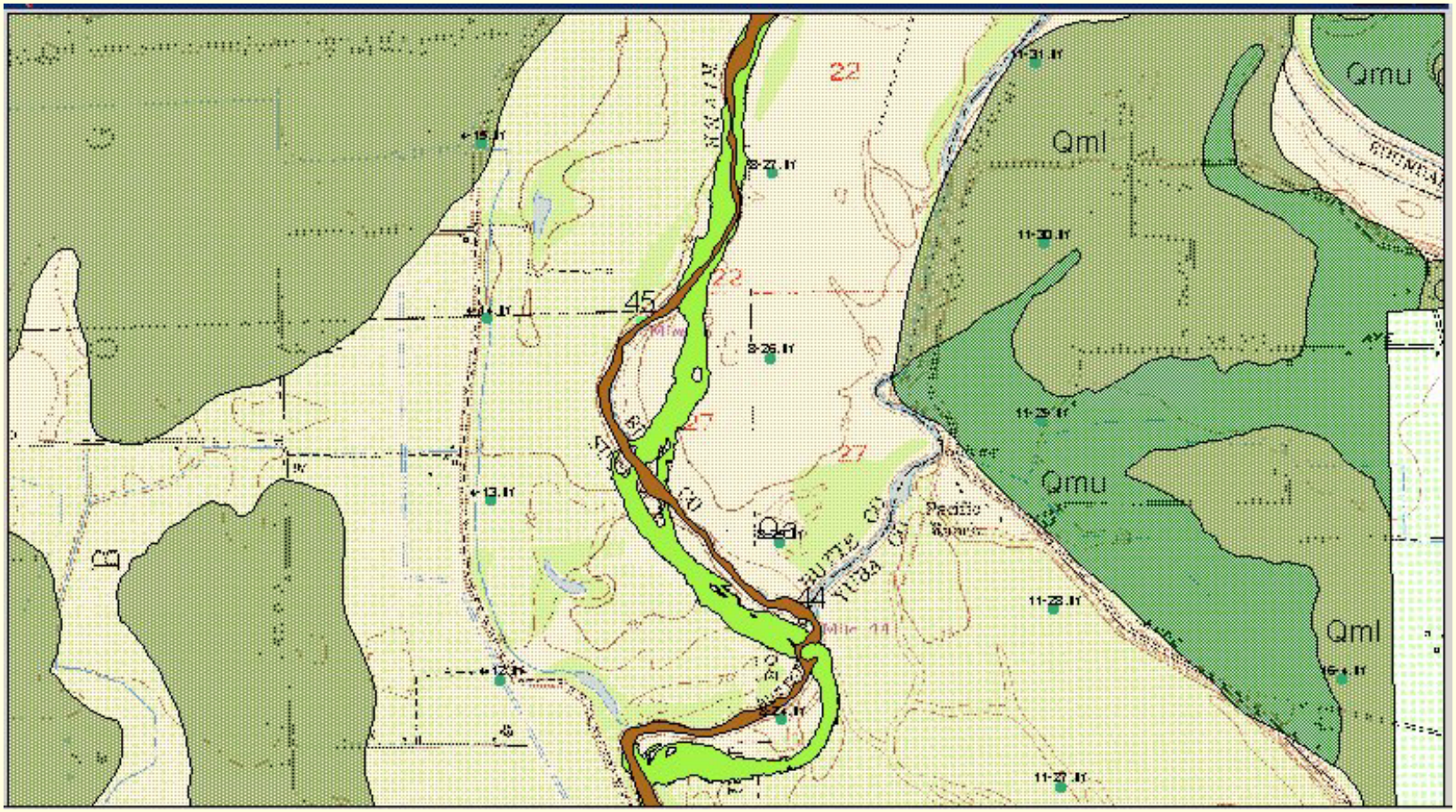
1907 SURVEYS

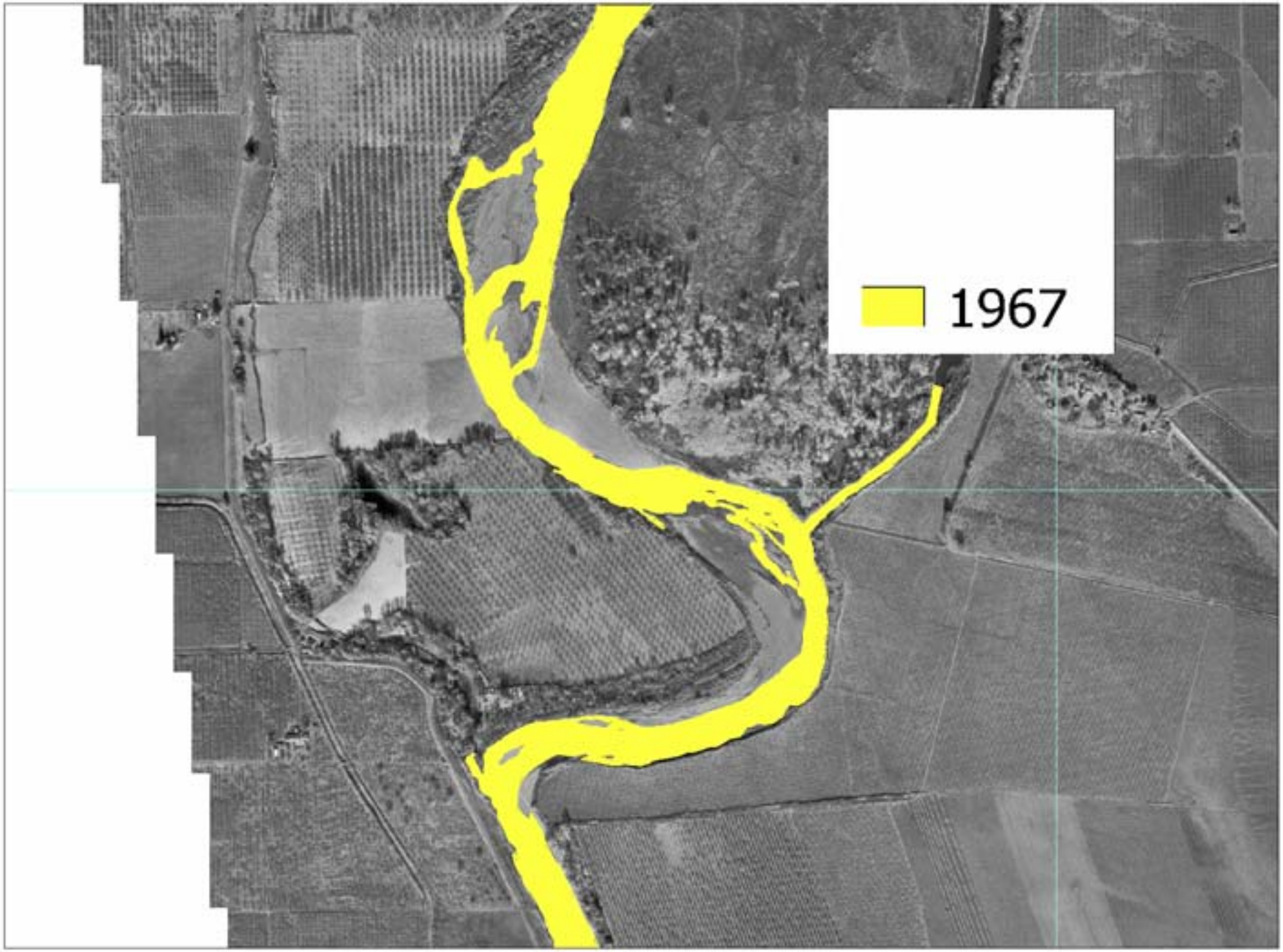
ARMY CORPS OF ENGINEERS

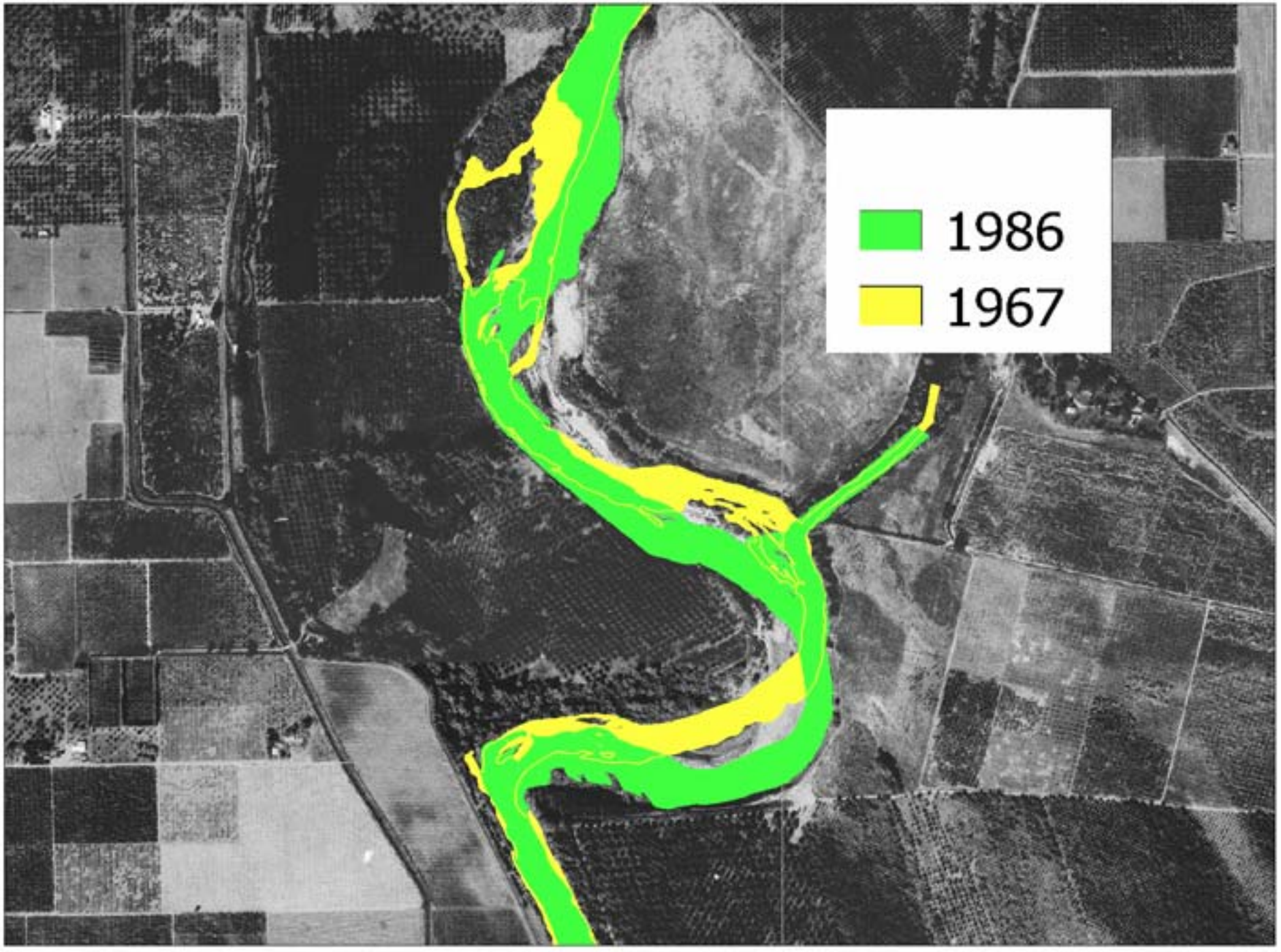
MEANDER CUTOFF
1967 TO 2001

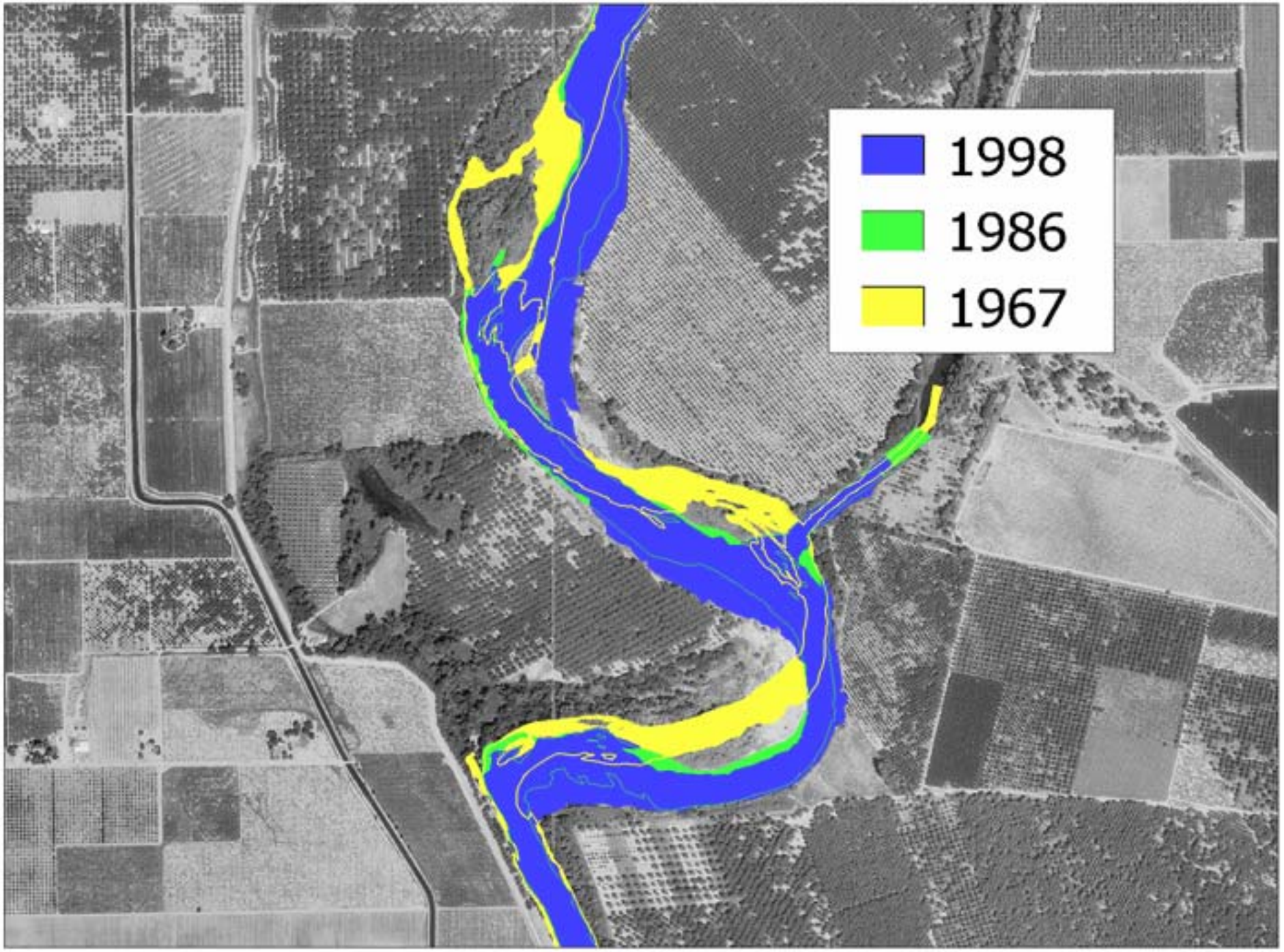


POST DAM RIVER MOVEMENT




1967


1986
1967


1998
1986
1967

SP-G2 PROGRESS REPORT

THE END